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## UNITED STATES DEPARTMENT OF AGRICULTURE

## SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports\*  
for  
SOIL CONSERVATION SERVICE RESEARCH\*\*  
JULY 1949

EROSION CONTROL PRACTICES DIVISION

Effect of Land Rest on Crop Yield - O. R. Neal, New Brunswick, New Jersey. - "Runoff studies have shown repeatedly that runoff and soil loss are reduced as a result of land resting treatments. Cultivated land, left in a non-cultivated, organic-matter-producing crop for a year, shows less erosion and higher crop yields when brought back into cultivation.

"A field test involving a study of the effect of crop rotation or land resting on the growth and yield of sweet corn was conducted on the Vineland Training School Farm in cooperation with Mr. Henry Renne, Farm Manager. During 1947 a field was rested in ryegrass, vetch, and some red clover. In the later summer this was disked down to get a reseeding of vetch. The reseeding of vetch was poor but allowed to grow and mature during the year of 1948 which kept the field out of cultivation two years. During 1948 an adjacent field was rested in ryegrass, vetch, and red clover for one year. Both the one-year and two-year resting treatments were on similar soil conditions. The fields were planted to sweet corn this year and received identical treatment. The yields obtained were as follows:

2-year Rested - 3,310 No. 1 ears per acre weighing 1,968 lbs.

1-Year Rested - 2,787 No. 1 ears per acre weighing 1,603 lbs.

"The two-year resting treatment gave an increase of 19% more marketable No. 1 ears with a gain of 23% in weight over the one-year resting treatment.

"A strip of land which had been cultivated in peppers during 1948 then seeded to wheat and vetch for winter cover bordered the one-year resting treatment described above. A test with another variety of sweet corn planted 10 days later was run on the cultivated field and on a comparable area of the one-year rested land. The yields obtained are given on the following page.

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\*\* All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

1-Year Rested - 6,097 No. 1 ears per acre weighing 3,136 lbs.

Wheat-vetch winter cover - 5,052 No. 1 ears per acre weighing  
following cultivation 2,613 lbs.

"The one-year resting treatment gave an increase of 21% more marketable No. 1 ears with a gain of 20% in weight over the cultivated land with a winter cover crop.

"Plant height measurements were made twice during the season to correlate growth differences with yield as affected by the resting treatments. Differences in plant height during this season were not found to be significant between any of the treatments."

New Potato Harvester Ready - John W. Slosser, Orono, Maine.-"The one-row harvester has been completed and delivered to Aroostook State Farm for display at the annual Field Day program on August 10.

"Equipment including the large potato handling truck has been repaired for the harvest operation which will commence in September."

The Effect of Early and Late Turning of Winter Covers of Volume Weight of Soil - C. S. Slater, Beltsville, Maryland.-"Ridged rows, to prevent summer erosion, have been under field test with corn and tobacco at Beltsville for a number of years. Winter cover crops are used to prevent winter erosion, and to furnish green manure. We tested recently to determine how effective these covers were in preventing slumping and compaction of the soil after it had been fitted for the crop.

"Volume weight determinations showed that green manures, plowed under, stabilized sandy soils against slumping when wet by rain as shown in the following table.

Cover	Time of plowing in relation to growth of cover	Volume Weight
None	early	1.46
None	late	1.40
Vetch	early	1.44
Vetch	late	1.38
Rye grass	early	1.41
Rye grass	late	1.37
Rye grass & vetch	early	1.40
Rye grass & vetch	late	1.34
Wheat and vetch	early	1.44
Wheat and vetch	late	1.35
Rye and vetch	early	1.41
Rye and vetch	late	1.34

"Late turning promoted maintenance of the tilth that was obtained by plowing. Vetch, which contains only a small amount of decay-resistant organic matter was little better than no cover crop at all. The wheat and vetch plow (early turned) tends to fall in the same category because of failure to get a good catch of wheat. The use of rye and rye grass was most effective in maintaining a loose soil structure."



Methods of Controlling Brush - Harley A. Daniel, Guthrie, Okla.-

"Regardless of the method used in controlling brush, the ability of a site to produce palatable plants will often be indicated by the kind of grass intermingled in the brush. The erosiveness and fertility level of the soil are important in regrassing after brush removal. If the soil is shallow or subject to water and wind erosion, the method of brush control should be one which will conserve the maximum of residues. Information of this nature is given in Table 1. The soil on this particular site was rather shallow but it had a fair level of fertility and had not been over-run by fire or misused for several years. Grasses found in the undisturbed woods were big bluestem, little bluestem, Indiangrass, switchgrass, purple top, and sand lovegrass. Due to the competition of the brush, these grasses were small, spindling, and greatly depressed in growth.

Table 1.--Amount of vegetative cover in November, 1948, on uncleared and cleared oak land at Guthrie, Oklahoma.

Brush Treatment 1/	Date Treated	Cover (Pounds per acre)			Sprouts Per Acre Remaining	Increase of Native Grass over Undisturbed Scrubby Oak Percent
		Native Grasses	Weeds & Annual Grasses	Residue Accumulation		
Undisturbed 2/		645	47	7080	22,244	
Crushed, Marden Brush Cutter	June 1946	1957	517	3991	27,720	203.41
Weedone (2,4-D) 3/ (Spray)	June 1945	3013	233	7593	2,250	367.13
Ammate (Spray) 4/	Sept. 1945	3010	843	3088	1,120	366.67

1/ Chemicals applied according to manufacturers' recommendations.

2/ Original cover of scrubby oak.

3/ Retreated May 1947.

4/ Retreated with 2,4-D May 1948.

"After the brush was removed the grass developed rapidly. Where it was crushed with a machine onto the soil, grass production at the end of the second growing season had been increased about three times. There were more sprouts per given area than originally, but their reduced size permitted good grass development. Where the chemicals were used, resprouting was greatly reduced. There were 25 times more sprouts on the plots cleared mechanically than on those sprayed with Ammate. By the end of the third growing season grass production on the chemically treated plots had increased approximately five times."

Peach Tree Growth on Contour Ridges - John T. Bregger, Clemson,

S. C.--"In a ten year growth comparison between plot row trees planted on plow built contour ridges vs. guard row trees planted on original machine built Nichols terraces, there is now only a small and insignificant difference of 7.4%. This difference was 29% in favor of the guard row trees at the end of the second growing season. The factor responsible for the gradual size gain of interterrace trees is undoubtedly the contour cultivation which has built up those ridges to approximately the same profile as the original terraces now are. From the viewpoint of a casual observer, there

is little or no visable difference between the two types of terraces. After ten years there is also no significant difference between trees planted on exact top of terrace ridge and ten feet below channel. There also remains no size difference between guard row trees planted at two different spots on the terrace ridge. Summarized data appear in Table 1.

Table 1.--Tree size based on location of trees on terrace profile.

Location	Trunk Circumference
Guard rows on Nichol terrace ridges	22.55 inches
Plot rows on interterrace ridges	21.15 inches
Guard rows - 10 feet below channel	22.65 inches
Guard rows - on top of terrace ridge	22.54 inches

Influence of Tillage and weed Growth on Soil Moisture - John T. Bregger -

"Following the lead of previous years' studies on soil compaction, a new set of gypsum blocks installations were made last fall in a Cecil clay soil near the Experimental orchard. One third of the area chosen was cultivated after each rain, another third kept free of all plant growth (weeds) and the other third allowed to grow up to such voluntary weeds and grass as would occur naturally under orchard conditions.

"Blocks were placed in a straight row across the three plots close together at the dividing line between plots and farther apart in the middle. Installations were made at the six inch depths except one for each plot.

"Reports will be made at a later date regarding the 'horizontal effects' of cultivation and plant cover. However, preliminary data can be presented at this time on the more general effects of the three treatments on soil moisture. (See Table 2 on the following page.)

"It is very clear that tillage has a definite conservation effect on soil moisture in a Cecil soil. Plant growth plus compaction is responsible for heavy moisture losses, while surface compaction alone results in many times the evaporation rate of cultivated soil. In addition, soil compaction increases runoff with the result that the water intake from subsequent rains is less in the uncultivated soil.

Table 2.--Soil Moisture Under Three Types of Soil Management (at 6" and 12" Depths).

Cultural Practice	Approximate per cent available water											
	5/17	5/19	5/20	5/22	5/23	5/25	5/27	6/1	6/9	6/10	6/13	6/20
Cultivation (6")	98	96	90	83	83	95	90	90	75	70	70	80
Cultivation (12")	100	100	100	100	100	100	100	100	100	90	90	100
No tillage - no weeds (6")	95	70	67	15	30	50	60	75	15	12	12	75
No tillage - no weeds (12")	100	100	100	100	100	95	100	100	90	80	75	100
No tillage - Weeds (6")	90	60	40	18	22	70	70	70	8	5	10	80
No tillage - weeds (12")	100	100	100	100	100	90	90	95	55	35	25	100
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Rainfall for same period	5/8	5/10	5/22	5/24	5/30	6/14	6/16	6/25				
	1.5"	0.6"	0.2"	1.0"	0.9"	0.6"	1.4"	0.4"				



Effect of Sweetclover-Oats Cover on Soil and Water Loss - J. R. Johnston.—"The importance of vegetative practices in conservation farming is gaining rapidly in the Texas Blacklands. This is attributed to the fact that grasses, legumes, and fertilizers are being used more and more by farmers of the area for soil and water conservation, improvement of soil productivity, and forage production. The farmers are attracted to these practices because they produce marketable products in addition to doing yeoman service in soil and water conservation.

"The study on management of oats and sweetclover residue in a 2-year rotation with cotton has given some interesting data this year. Even though the effects of residue management treatments are not in evidence this early in the experiment the data afford some interesting comparisons insofar as the effect of vegetative cover on soil and water loss is concerned. Five storms causing runoff have occurred to date in 1949. These data are summarized in Table 1.

Table 1.—Effect of vegetative cover on soil and water loss\* from Houston black clay on 2.37 percent slope.

Date of Storm	Amount of Rainfall	Cotton (Rows Across Slope)		Oats-Madrid Sweetclover	
		Soil/loss	Runoff	Soil Loss	Runoff
	Inches	T/A	Inches	T/A	Inches
3-21-49	2.10	-	-	0.020	0.016
4/24-25/49	2.61	0.509	0.237	0.003	0.017
4/28/49	1.39	0.222	0.178	0.006	0.008
6/14/49	2.53	2.836	0.727	-	-
6/22-23/49	1.72	1.084	0.409	-	-
Totals	10.35	4.651	1.551	0.029	0.041

\* Each figure represents average data from 6 plots.

"The 2-year rotation of cotton, oats-Madrid sweetclover (fertilized) now shows promise of providing effective vegetative protection for the land 75 percent of the time. This may be attained, providing the oats-sweetclover stubble can be left unplowed until March preceding cotton planting in April. The problem confronted here is seedbed preparation for cotton in such a short time. If the vigorous Madrid sweetclover can be left on the ground during the second winter it should be a valuable replacement for the present practice of planting peas and vetch for winter cover and green manure."

Land-Capability Classes in Relation to Crop Production - J. R. Johnston -

"More and more emphasis is being placed on land capability classes in conservation farm planning. The production of crops from the different land classes varies considerably; those variations are considered valuable in planning crop rotation for specific farm units.

"Hay yields from two forage crop mixtures growing on 3 classes of land are reported in Table 2. These data show marked difference in forage production from the different land classes. Production was much better on the better classes of land.

"Little thought heretofore has been given to cotton root rot as a differential factor in cotton production from different land classes. The data reported in Table 3 show that root rot incidence becomes progressively



worse from good to poorer land classes. These data, if repeated in other years, will have considerable bearing on what land should be used for cotton production in this area.

"Approximately seven man days were spent in conferring with agricultural workers and farmers during the month.

Table 2.--Hay yields\* from 3 classes of Texas Blackland during 1949.

Land Class	Fescue grass-Madrid sweetclover	Fescue grass-Alfalfa
Class I	3951	3416
Class II	2303	2151
Class III	1283	1402

\* Pounds dry matter per acre, each figure represents the average of 3 plots.

Table 3.--Effect of land class on root rot incidence in cotton.

Land Class	Percent dead plants on different dates		
	July 1	July 15	August 1
Class I	0.35	2.70	5.20
Class II	1.80	8.40	22.00
Class III	1.80	17.70	48.00

\* Each figure represents average data from 17 plots.

Soil and Water Losses in Relation to Crops and Conservation Practices - O. E. Hays, La Crosse, Wisconsin.--"Some interesting records have been obtained at Owen during seven runoff periods between May 4 and July 5. These plots are on a 3-percent slope of the poorly-drained Almena silt loam. Plots are 300 feet long by 33-1/3 feet wide.

Table 1.--Soil and Water Losses from Four-Year Rotation

Crop	Up and Down Hill Cultivation		Contour Strip Cropping		Contour Terracing	
	Runoff Inches	Soil Loss Tons/Acre	Runoff Inches	Soil Loss Tons/Acre	Runoff Inches	Soil Loss Tons/Acre
Corn	1.45	3.12	1.47 (1)	0.98	1.72	(2)
Grain	2.09	1.05	0.49 (1)	0.16	1.77	
Hay-1	0.63	0.01	0.18 (1)	0.03	0.31	
Hay-2	0.69	0.02	0.54 (1)	0.05	0.48	

(1) Corn-hay or grain-hay on strips; crop immediately above concentrating trough is indicated in first column.

(2) No soil loss determinations for terraces.

Table 2.--Soil and water losses from three-year rotation planted and cultivated up and down hill

Crop	Runoff Inches	Soil Loss Tons/Acre
W. Wheat	0.01	0.00
Hay-1	0.16	0.00
Hay-2	0.02	0.00

Variations in Crop Yield Due to Inherent Variations in Plots and to Past Treatments - O. E. Hays.--"The plots on the Gugel farm located near Madison are in uniform treatment this year. Mr. Bay harvested the grain from small plots within the large plots to determine variations in productivity. The following table shows the variations in yield as influenced by inherent soil variations and differences in past treatment.

Table 3.--Oats Yields (bu./acre), 1949, Gugel Farm Runoff Plots

Plot No.	Sample Location above Concentrating Trough					Plot Average
	20'	60'	100'	140'	180'	
1	41.1	20.8	35.2	33.7	37.9	33.7
2	27.3	35.3	29.3	30.5	25.9	29.7
3	21.9	32.5	30.1	41.9	41.1	33.5
4	30.4	37.6	32.5	29.5	50.0	36.0
5	25.1	33.7	37.5	40.6	51.6	37.7
6	29.0	34.4	39.4	45.8	44.4	38.6
7	45.4	41.8	35.1	31.4	27.7	36.3
8	35.6	41.5	42.9	27.1	29.4	35.3
9	32.4	40.4	36.3	33.7	41.5	36.9
10	46.7	46.1	41.3	43.8	58.9	47.4
11	52.1	51.4	41.4	50.2	53.1	49.6
12	41.7	45.2	45.0	44.7	44.4	44.2
13	44.7	38.1	45.4	45.7	36.3	42.0
14	46.2	48.3	54.3	53.6	51.7	50.8
15	54.4	56.8	45.5	54.1	51.4	52.4
16	44.2	53.9	49.7	51.0	63.4	52.4
17	47.3	46.4	54.1	48.3	62.2	51.7
18	43.9	49.7	43.7	46.3	45.9	45.9
19	44.7	51.5	43.8	53.0	57.1	50.0
20	41.6	45.9	57.0	60.7	57.6	52.6
21	60.9	48.0	51.3	57.0	57.1	54.9
22	55.0	53.4	57.4	64.9	67.5	59.6
23	51.4	67.5	58.7	66.6	70.6	63.0
24	72.2	64.5	60.8	63.1	61.2	64.4
25	65.0	59.8	67.5	70.3	71.0	66.7
26	57.9	54.4	62.9	56.4	44.5	55.2
Total Dif.	50.2	46.7	38.2	43.2	44.4	37.0

Summary of Progress in the Study of Conservation Economics - H. O. Anderson.--"Adoption of a soil conservation program usually entails changes in the acreages of different crops - usually an increase in forage crops and a decrease in corn and small grains. The questions then arise as to how more hay and pasture can be used most profitably and as to how small an amount of grain can be fed to dairy cows without reducing net returns. An analysis of the most profitable use of the new feed supply obviously is an important part of the farmer's plan to conserve soil.

"A study of cropping systems of some of the best soil conservation farms in several areas of the state, shows a tendency for farmers to deviate from recommended soil conserving rotation of crops. Soil conserving crops were raised on from 43 to 51 per cent of the cropland on these high scoring soil conservation farms as compared with recommendations for from 53 to 63 per cent soil conserving crops. In most areas, the actual rotations were 'short' one year of soil conserving crops in the rotation. That is, where three years of hay in a rotation were recommended only two years of hay were raised. (This type of deviation from soil conserving recommendations tends to prevail in other states of Region III as well as in the country as a whole.)

"As a means of determining possibilities for reductions in grain requirements for dairy cows, a study was made of records from farms in two dairy sections of Wisconsin. Results of the study of 551 dairy herds in the Fennimore and Coon Valley Areas show that good dairy production was obtained with rather modest grain rations. Several herds of the different dairy breeds averaged 300 pounds of butterfat, or more, per year on an average concentrate consumption of 1300 to 1700 pounds. The average 'soil conserving' crop rotation recommended for Wisconsin farms produce sufficient small grain and corn to provide this amount of grain for the dairy herds on these farms. From the standpoint of a strictly dairy farm, there would be no need for raising a larger acreage of corn and grain and a smaller acreage of hay than is needed for the conservation of soil.

Table 1.--Butterfat produced and feed consumption, per cow, by breeds of dairy cattle.

Breed	Herds No.	Total Records	Butterfat per cow	Concentrates Pounds	Hay Pounds	Silage Pounds	Roughage Pounds <sup>1/</sup>
Jersey	4	22	306	2323 <sup>2/</sup>	3660	3150	4710
Guernsey	5	31	312	1652	3950	5200	5783
Holstein	3	19	301	1322	4334	4739	5914
Brown Swiss	1	7	284	1508	6400	4000	7733 <sup>3/</sup>

<sup>1/</sup> Pounds of hay plus one-third of the weight of silage.

<sup>2/</sup> Two of the four Jersey herds were show herds and probably were fed more liberally than the average Jersey herd that does not need to be kept in show condition.

<sup>3/</sup> Hay and silage of poor quality.

"In general, the 551 dairy herds included in this study were 'underfed' in 1938-39 and responded to more ample grain feeding in succeeding years. In 1943 and 1944, many of the cows undoubtedly were fed up to, or past, the point of the greatest net returns. In other words, some farmers probably lost money in the latter two years by overfeeding on grains and protein supplement. They also had larger soil losses than they would have had if they had raised larger acreages of hay.



Table 2.--Annual butterfat production and feed consumption per cow, average of Guernsey, Holstein, Jersey and Brown Swiss herds, Coon Valley and Fennimore.

	Butterfat lbs. per cow	Concentrates lbs. per cow
1938	232	763
1939	228	855
1940	244	925
1941	260	1230
1942	257	1306
1943	254	1583
1944	256	1441

"During the latter part of the period covered by this study (1941-44) when butterfat prices were high, relatively, nearly all of these farmers increased grain rations of dairy cows. Most of them got a favorable return from the extra feed, but many of them fed more grain and protein supplement than the increase in butterfat production warranted. Obviously, larger quantities of concentrates could be fed profitable to the better cows than to those with lower inherent producing ability.

"The study also showed that no dairy herd averaged 300 pounds of butterfat per cow annually unless at least 1000 to 1200 pounds of grain and protein supplement were fed per cow. All roughage feeding apparently was not a profitable system of feeding for these herds, probably because of insufficient supply of high quality hay and pasture.

"While ample supplies of good hay and good pasture is the foundation of good dairy feeding, there was no direct evidence that much larger quantities of roughage could be fed profitably. Thus, if soil conservation needs require a larger production of hay, it probably will be more profitable to increase the number of dairy cows on many farms rather than to utilize the additional hay by feeding more hay per cow. It is obvious that wherever too little hay and pasture is being provided at the present time, an increase in roughage rations is desirable. Production of higher quality hay, silage and pasture unquestionably would tend to increase roughage consumption and permit reductions in grain and protein supplement feeding without a reduction in milk flow.

"The experiences of these farmers indicate that it might be profitable to feed a little less grain than was fed in 1943 and 1944. It should be relatively easy to get the right feed combination for the dairy herd from a soil conserving rotation. Whatever concentrates are lacking usually can be purchased and fed at a profit."

1.75 Inches of Rain of Very High Intensity Falling on Wet Ground Caused Severe Erosion - H. G. Porterfield.--"All cotton and grain sorghum plots on the Station were destroyed on June 12th by a severe rain and hail. Ridges were washed almost completely flat, and cotton 3 inches in height was completely covered. Hail damage was severe on wheat and ranged up to 60% on early varieties. This 1.75 inch rain was of a very high intensity, and the damage was extremely heavy for a rain of this amount. The soil was heavily

saturated from rains on June 6, 7, 8, 9, 10, and 11. According to farmers that have been in the area for 40 years, more water erosion occurred from this rain than has ever been experienced. The water erosion damage was what could be expected from a 5 or 6 inch rain of high intensity in a rolling area. Fortunately the area it covered was only a few square miles. Terrace systems were badly damaged, and contour rows adequate under a wide range of conditions, were possibly more of a hazard than a benefit due to water concentration in local low areas, which cause breakovers. Wind velocity was high, and a garage was blown from its foundation, as well as a small building wrecked. Roofs were also damaged from wind and hail. Planting over following this rain was the third time that cotton had been planted on most fields and plots, and the second time for grain sorghums. These hard rains left the surface smooth with a high concentration of sand on the surface, and in perfect condition to blow. Some wind erosion had started to occur before the land could be worked due to local wet spots. On June 24th a severe sand storm occurred, and in areas not destroyed from the rain a large amount of crop was covered by sand."

A New Heavy-Duty Sandfighter - H. G. Porterfield. - "A heavy-duty sandfighter developed from ideas obtained for the past year, was tried on some field plots during the month. This implement is peculiar to this sandy area, and has been in use only a short time. Several types are made, and the implement is not standardized. It is used after a rain to roughen the surface of the soil to prevent wind erosion. This heavier built machine has longer, wider and closer spaced cutting bars, which roughen the soil to a greater degree than previous models which have been built during the steel shortage. It will not cover small crops, which is the principal objection to the stalk cutter when the crop is small. Also, the draft is light, and the machine takes nine rows, which makes it possible to cover large acreages in a short time. It can be easily turned, which is an improvement over many of the models in use. Farmers that have seen this machine, and its work, have been favorably impressed, and believe this machine will quickly replace the lighter types. We believe we have another tool to aid in the control of wind erosion on sandy row-crop land when the crops are small. This was the second model built. The first model developed, roughened the surface more than the machine in general use, however, the cutting bars were too short, and too widely spaced. A different type of cutter bar, as well as a heavier bar remedied this defect without throwing enough soil to cover very small crop. The soil is roughened, by a combination packing and cutting action, and is not moved enough to cause it to fall in the furrows."

Pasture Irrigation at the Arnot Station - John Lamb, Jr., Ithaca, New York. - "Approximately 2" of effective water was applied to the pasture plots in May. Yields were taken June 1, and the cattle turned on. The yields were as follows:

Fertilizer applied spring of 1949	Yields over dried, tons/acre		Increase for water added
	Water added	No water added	
None . . . . .	0.65	0.31	0.34
500 lbs. of 10-10-10 . . . .	1.17	.95	.22
1,000 lbs. of 10-10-10 . . . .	1.38	1.64	-.26
500 lbs. of 0-20-20 . . . .	0.70	0.46	.24



"The increase in yield for water seemed to be largely due to increased ladino clover growth. The high-nitrogen plots had a lower percentage of clover, probably due to allowing the grass to shade out the clover in 1948.

"As soon as the cattle grazed the grass down, they were removed, fertilizer was applied to certain plots and then irrigated. Approximately 3.5 inches of effective water was applied in June. At the end of the month, the watered plots were lush and green, and the others were sparse and dry."

The "Dry Weather" Erosion Pattern - G. R. Free, New York.-

"Usually we think of erosion damage as something associated with fresh washing or deposition, but this has been a year when marked effects of past erosion could be seen in many fields with no rain falling. Beans and much of the corn in the Marcellus area were planted after the May rains and did not receive any measurable precipitation for 3 weeks or more. Stand was poor in many fields, but it was particularly poor on eroded spots.

Stands Affected by Method of Seedbed Preparation - "Disking, subsurface plowing, and ordinary moldboard plowing are being compared at Marcellus. After planting corn the latter part of May, there was no measurable precipitation until June 19. All of the corn on the plowed plots got off to a rapid start despite the drought, but 'come up' on the disked and subsurface plowed plots ranged from only fair to very poor. By the end of June, some of the corn on plowed plots had reached a height of over 40 inches, while some of the corn on the other plots was still just coming up or was only a few inches high. The stands on these plots now show promise of being fairly satisfactory, indicating that the trouble was not due to planter difficulties or surface trash but rather to planting in dry soil. Corn on good soil with a good seedbed shows every promise of producing a good crop. The high temperatures have caused rapid growth of this crop. We rather like the following quotation from a recent article on corn in Louisiana which appeared in the March 1949 issue of Better Crops with Plant Food: 'Generally speaking, it never rains enough to make a good corn crop on thin or poor soil, but the weather is generally favorable on good soil, if other things are done well'."

Growth of Tomato Plants in Relation to Soil Compaction - D. S. Hubbell, State College, N. M.-"Tomato seedlings were grown in No. 3 enameled tin cans on normal Gila clay previously compacted to various degrees. Complete nutrient solutions were added to the pots intermittently and were watered daily with distilled water. At the end of approximately 80 days, the plants were harvested, dried and weighed. The apparent density of the soil in each pot (can) was also determined.

"As is shown in the following table, the reduction of yields of dry matter is associated with an increase in apparent density of the soil. The greatest drop in yield occurred at an apparent density of 1.43. It was also noted that seedlings would die off at densities above 1.58 or 1.54; the threshold density, above which tomato roots were probably unable to penetrate."



Growth of Tomato Plants on Gila Clay at Different Apparent Densities

Wt. of Dry Tomato Plant	Apparent Density of Soil	Remarks
(gms)	(gms/cm) <sup>3</sup>	
23.1	1.22	Plants bloomed and bore after 80 days
22.4	1.24	
21.8	1.25	
20.0	1.26	
18.8	1.30	Plants bloomed only and flowers dropped in May
17.2	1.33	
15.5	1.34	
14.0	1.33	
12.4	1.39	
13.9	1.35	
8.3	1.43	Stunned and growth stopped in April
7.1	1.45	
6.7	1.46	
2.5	1.54	Seedlings died off a few days after planting
1.6	1.58	

Effect of Chopped Tree Prunings on Tobacco Growth - C. S. Britt, Beltsville, Maryland.-"Woody pruning material, containing a large proportion of fresh chopped leaves and wood chips, is being made available for test by a tree pruning company through arrangements worked out by Mr. A. C. McIntyre and Mr. W. W. Steiner. This material is brought to the station in a tight dump truck and is in a high state of fermentation. Following this heat period (approximately two to three weeks), considerable mold and fungus growth is evident in the piles of material.

"Three to four tons per acre of this material has been applied to a total of six plots -- four plots have been planted to tobacco and two have been left bare for detailed studies of nitrogen. The tobacco crop growth is slightly irregular on all plots receiving the material; however, on some of the plots with legume residues the tobacco has a good color. On one plot with a heavy crabgrass residue, the tobacco is very yellow and the growth is poor.

"These observations are in line with nitrate tests run by Dr. Roy C. Dawson. On the basis of these observations and tests, the plots have been split and nitrogen applied to parts of the plots to maintain adequate nitrogen for good tobacco growth."

The Effects of Different Winter Cover Crops on Nitrate Nitrogen in the Soil of Tobacco Land - R. C. Dawson, College Park, Md.-"The winter cover crop tobacco plots were sampled again in nitrate nitrogen on July 7 and 8, one month after the crop was planted. The data are shown in the following table.

Distribution of Nitrate Nitrogen (ppm) within the top 3 Feet of Soil Under Different Cover Crops (Sampled July 7 and 8, 1949)

Depth of Sample	Cover crop in rotation with tobacco							Depth Mean
	Rye-grass	Ryegrass + (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	Bare	Wheat + Vetch	Rye + Vetch	Ryegrass + Vetch	Vetch	
1'	6.38	7.15	8.78	9.91	15.75	16.73	17.05	11.68
2'	2.58	3.68	3.94	5.61	6.10	6.19	7.09	5.03
3'	2.14	3.19	4.28	3.53	3.04	3.51	4.61	3.47
Cover Crop Mean	3.70	4.67	5.67	6.35	8.30	8.81	9.58	6.73

	Differences needed for significance at:		
Cover Crop	5% level	1% level	0.1% level
Cover Crop	2.65	3.54	4.66
Depth	1.74	2.32	3.05
Cover Crop X Depth	4.59	6.14	8.06

(a) Cover Crop - The mean nitrate nitrogen content of the different cover crops is shown in the bottom row of the table. Vetch yielded the highest value (9.58 ppm) which was significantly greater than wheat-vetch at the 5% level and greater than all non-vetch plots at the 1% level or better. Ryegrass and vetch plots had more nitrates (8.81 ppm) than all non-vetch plots. Rye and vetch (8.30 ppm) was higher at the 1% level than ryegrass alone or with ammonium sulphate. Wheat and vetch exceeded ryegrass alone (5% level).

(b) Depth of sampling. The top foot contained a greater concentration of nitrates (significant at the 0.1% level) than either the second or third foot.

(c) Cover crops X depth. In the top foot of soil twelve of the possible 21 comparisons showed a significant difference (top row of table). Vetch alone, with rye or with ryegrass contained more nitrates than wheat-vetch, bare, ryegrass alone or with ammonium sulphate. In the second and third foot depths there were no significant differences that could be attributed to the kind of cover crops (second and third rows of table)."

Nitrate Nitrogen in Relation to Tillage Practices in Summer Fallow Wheat Land - Torlief S. Aasheim, Havre, Montana.-"This spring soil samples were taken for the purpose of determining the amount of nitrate nitrogen present in summer fallow at Froid and Havre. The analyses were run by the Agronomy and Soils Department of Montana State College. The results of these analyses are given in the following table:

Type of Summer Fallow	Depth	
	1st 6"	6" to 18"
<u>Froid, Montana</u>		
Moldboard plowed fallow	8.2	6.7
Stubble mulch fallow	6.5	5.1
<u>Havre, Montana</u>		
Subtilled (stubble on surface)	16.1	7.9
Subtilled (stubble burned)	15.5	5.9
M. Bd. plowed (stubble plowed under)	15.8	7.9

"Soil samples were taken again at heading time at Froid. Results of analyses of these soil samples have not yet been received."

Summary of the Rate of Soil Loss on Terraced Land at Bethany, Missouri - D. D. Smith, Columbia, Missouri.- "Soil losses are measured at the ends of terraces on the Shelby soil of the Soil Conservation Experiment Station, Bethany, Missouri during the period 1931-42 have been reviewed because of their application of flood control planning. These soil losses represent the amount of the soil that will be carried off the farm and into the streams. Losses for three cropping systems were as follows:

Rotation	Period	Land Slope (%)	Channel Grade (In.)	Annual Soil Loss (Tons/Acre)
Corn-oats-meadow	1932-40	7.4	4	0.76
Corn-oats-meadow	1932-40	12.4	4	1.11
Corn-oats, sweet clover	1932-41	8.3	0-4	1.74
* Corn-soybeans-wheat-meadow	1932-41	9.4	0-4	2.12

\* All crops represented each year on a separate terrace.

"The maximum rate of runoff recorded from an individual terrace was 3.5 inches per hour from the terrace in corn-oats, sweet clover rotation for the rain of April 3, 1934. This rain fell on soil disked for oats. It totaled 3.6 inches and had 5-, 15- and 30-minute intensities of 5.76, 3.12 and 2.56 inches per hour, respectively. Soil loss from the terrace for this rain was 5.91 tons per acre. It was the maximum recorded from an individual terrace during the 12-year period of study."

Influence of Cropping on Percolation, Pore Drainage, and Volume Weight in Certain Clay Loam Soils - C. A. Van Doren, Urbana, Illinois- "Samples were collected with a three-inch core sampler on three farms in central and northeastern Illinois for determination of influence of cropping on percolation, pores drained, and volume weight. Fields were selected that had been farmed to cultivated crops in intensive rotations for a number of years. Samples in grassed areas were collected in unplowed pastures and in fence rows. The data are summarized in table 1.



Table 1.--Percolation, pores drained, and volume weight as influenced by cropping.

	Percolation Inches per hour		Pores Drained % of Soil Volume		Volume Weight	
	Cultivated	Grass	Cultivated	Grass	Cultivated	Grass
Flanagan silt loam	0.2	2.9	4.0	11.5	1.34	1.05
Bryce silty clay loam	0.3	18.7	5.7	18.7	1.41	1.11
Elliott silt loam	0.9	11.5	6.3	15.8	1.41	1.12
	0.5	11.0				

"Percolation in inches per hour through the 3" core samples was from 13 to 60 times greater in the grass than in the cultivated soil. Non-capillary pore space was from 2 to 3 times greater on the grass than on cultivated areas. The volume weights give an indication of the relative compaction of the soil on cultivated and grassed areas.

"Percolation of water into grass land was 22 times as fast as movement of water into intensively cultivated soil. The cultivated soil was more compact and hence contained fewer large pores for movement of water and air.

Conservation Management of Pastures - C. A. Van Doren.-"In writing conservation farm plans long length of life of pasture seedings on sloping land is desirable to reduce seeding costs and lessen erosion. Management and treatment of pastures for maximum net returns and for conservation of soil and water is one of the major objectives of conservation research at the Station.

Water Losses, Hay Yields, Sheep Production on High-Conservation and Non-Conservation Pasture Plots (1)

	High-Conservation Pasture	Non-Conservation Pasture
Water losses, inches (1948)	4.0	7.4
Hay yields, pounds/acre (1946) (Forage and weeds not separated)	8317	4981
Sheep gains, pounds/acre (1948)	484	220
Weeds (1940-46), % of total forage	21	85
Weeds (1949), % of total forage	9	71

(1) High-conservation pasture has been treated with adequate plant food, including nitrogen, and has been moderately grazed. The non-conservation pasture has had no limestone or phosphate but has received nitrogen during 1948-49 and has been severely grazed.

"Conservation management of pastures reduced runoff from 7.4 inches to 4.0 inches in 1948. Yields of forage and sheep gains were almost doubled by good management. Weeds which constituted 21 percent of the forage during the period 1940-48 were reduced to 9 percent in 1949 by the application of additional fertilizers including nitrogen. On the non-conservation or poorly managed pasture the weed content was 71 percent even though nitrogen fertilizer was added in 1948 and 1949. There is definite encouragement that troublesome weeds can be kept out of pastures by applying good conservation practices."

Graded Vs. Level Closed-End Terraces - C. J. Whitfield, Amarillo, Texas.-For the crop year 1948-49, grain yields from graded terraced land was 36.28 bushels per acre, and from level closed-end terraced land 31.59 bushels per acre, an increase of about 5 bushels or 15 percent in favor of graded terraces. Volunteer wheat left on both types of terraced land made yields in about the same proportion, with 17.68 bushels on the graded terraces and 13.11 bushels per acre on the closed-end level terraces.

"Although of a preliminary nature, these results are very significant in that they bear out opinions of farmers and field personnel based on field observations during the past six to eight years of relatively favorable rainfall.

"The terraced area on the Amarillo station is on B slope, soil unit 2 and is common to almost every wheat farm in the High Plains of Texas and Oklahoma. The high yields secured this year show that this type of land can be farmed successfully and bring in excellent returns from the land by the use of good recommended farming practices.

"The following table gives the 1949 wheat yields on the terraced land:

Treatment	1949 Yield Bu. per acre	Remarks
Wheat, sorghum, fallow rotation, level closed-end terraces	31.59	1-year record
Wheat, sorghum, fallow rotation, graded terraces	36.28	1-year record
Volunteer wheat, level closed-end terraces	13.11	Wheat on fallow in 1948
Volunteer wheat, graded terraces	17.68	Wheat on fallow in 1948

Stubble Mulch Studies on Wheat Land - "Wheat produced on the stubble mulch plots in 1949 was analyzed for protein content. In the case of continuous wheat the subtilled plots produced a smaller amount of grain of a lower protein content as compared to plots cultivated by either the oneway or moldboard plows. As a result, about 21 percent less nitrogen was removed from the soil in the crop grown on subtilled land than in the crop grown on the oneway land. In the case of wheat on fallow, the subtilled plots again produced wheat of a lower protein content than did those cultivated with the oneway plow. In this instance, however, the greater yields obtained under the stubble mulch system served to offset the lower protein contents, so that noteworthy differences in the amount of nitrogen removed by the wheat crop under different tillage systems did not occur. In all instances protein content (N x 5.7) was over 12 percent and should be adequate for milling purposes. Protein contents of 14 percent, such as obtained on the oneway fallow plots, might, from the viewpoint of a farmer interested in conserving the fertility of the soil, be regarded as a luxury consumption of nitrogen and hence something to be avoided.



"Protein content, yield and pounds nitrogen per acre in wheat from the stubble mulch plots in 1949 follows:

Tillage Treatment	Percent Protein (N x 5.7)	Yield Bu. per A.	Pounds N per acre
	Continuous wheat		
Moldboard plow	12.92	23.2	31.5
Oneway	12.81	21.5	29.0
Subtilled	12.22	19.4	24.9
	Wheat-fallow-wheat		
Subtilled	13.26	38.4	53.6
Delayed subtilled <sup>1/</sup>	12.41	36.1	47.1
Oneway	14.05	36.0	53.2

<sup>1/</sup> Fallow by sub tillage in which the first operation is delayed until about April 1.

"The slightly larger yields obtained under the stubble mulch systems during six of the eight years that studies have been carried on at the Amarillo station have appeared to be due to the decreased tendency for over-stimulation accompanying the lower nitrification rates occurring under the stubble mulch. Early spring growth of wheat on stubble mulch is usually slow, and a more efficient use, as far as grain production is concerned, is made of the rather scanty and variable annual precipitation of the area, amounting to a little over 18 inches per year. Ratios of weight of straw to weight of grain produced on the stubble mulch plots have been determined for a number of years, and have been found to range from 0.84 to 7.64, depending on the season. Grain yields from stubble mulch plots in continuous wheat, 1942 through 1949 are shown in the following table.

Tillage	Wheat yield - bushels per acre								8-year average
	1942	1943	1944	1945	1946	1947	1948	1949	
Moldboard plow	20.3	4.2	19.7	4.4	1.8	31.8	5.6	23.2	13.9
Oneway	20.1	6.0	24.5	6.3	2.6	28.4	4.6	21.5	14.2
Subtillage	19.0	7.1	26.4	6.9	6.0	34.3	6.2	19.4	15.7

"In most years lower straw-grain ratios have occurred in wheat on fallow than in continuous wheat. Lower straw-grain ratios invariably have been found on subtilled land than on land cultivated by other tillage systems. In 1949 straw-grain ratios were less affected by tillage system than in most years. The year 1949 has been exceptional in that rainfall for the first 6 months was about 80 percent above normal. Throughout the spring subtilled continuous wheat showed a need for nitrogen. Soil tests also revealed a low level of available nitrogen. This year, in agreement with what has been observed in more humid regions, nitrogen, rather than moisture has been the limiting factor in wheat production on subtilled land. In most years, however, the reverse will be true, and the improved moisture-fertility balance under stubble mulch will result in higher yields. Pounds straw per acre and ratio of weight of straw to weight of grain of wheat produced on stubble mulch plots in 1949 is shown below.



Tillage	Weight of straw Pounds per acre	Straw-to-grain ratio
	<u>Continuous wheat</u>	
Moldboard plow	3980	2.86
Oneway	3790	2.94
Subtilled	3240	2.78
	<u>Wheat on fallow</u>	
Subtilled	6360	2.76
Delayed subtilled	5530	2.55
Oneway	5960	2.76

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.--"July rainfall ranged from 7.5 to 8.6 inches over the experimental area. Rain fell on 10 days. The greatest single amount reaching 2.35 inches caused the highest amounts and peaks on the small watersheds as shown below:

Table 1.--Runoff and soil loss from largest storms in July, corn watersheds

Date	Watershed No.	Land Treatment Slope %	Soil drainage	Runoff		Soil loss Tons per acre
				Total In.	Peak In/hr.	
July 6	109	12.7 Contour	Well	0.30	2.20	1.10
	115	6.6 Straight row	)	.64	3.89	.84
	123	5.8 Contour	)Slowly	.14	.68	.23
	127	10.0 Contour, mulch, 2,4-D	)permeable	.43	2.05	.42
July 9	109			.05	.36	.05
	115			.25	1.08	.18
	123			.01	.05	.02
	127			.19	.61	.22
July 21	109			.25	2.04	.16
	115			.36	2.57	.24
	123			T	.01	T
	127			.11	.80	.05
July 24	109			.05	.21	T
	115			.18	.46	.07
	123			0	0	0
	127			.05	.07	.01
Total	109			.67		1.35
	115			1.66		1.34
	123			.16		.25
	127			1.02		1.20

"Of the paired watersheds 115 and 123, the latter has been in conservation practice since 1941. The effect of contour, fertility level, and deep rooted legume appears to be greater than it was 4 years ago when the two areas were in corn.

"It is interesting to note the difference in runoff from the two contour watersheds 123 and 127. This is the first time trash mulch corn has been tried here on a tight soil. In fact, a seep spot occurs just above the flume on 127. Some of the runoff is seepage flow. The weed appearance of the two watersheds is greatly different. On 123 there are many rag weeds which furnish some soil protection. On 127 the 2,4-D (pre-emergence only) has controlled the weeds.

"Another item in this comparison is that soil moisture content was higher in the mulch watershed 127 all through the month. Therefore, the soil here could not absorb as much of the rainfall as could the drier soil in watershed 123. Corn on both areas looks very good."

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"Precipitation for the month of July varied widely throughout the Government-owned land and on the areas above Stations C and D. The maximum weighted rainfall for the month was on the area Y-10, 5.18 inches, and the minimum on the area W-6, 4.51 inches. Areas C and D had 2.27 inches and 2.63 inches, respectively. A large portion of this rainfall occurred on July 4 when the total rainfall at project headquarters was 3.07 inches. This storm of July 4 was the only storm of 1949 that has caused relatively high rates of runoff from most of the areas on Government-owned land. Table 1 shows the weighted rainfall, the total runoff, and the peak rate of runoff for each of the stations for this storm. The rain of July 4 was not uniform through the area, with a maximum rainfall occurring on the area Y with conservation practices. However, the rainfall intensity during the latter part of the storm was higher in the W area with ordinary farm practices. From table 1, however, it will be noted that, in spite of the greater rainfall on the Y area, the total amount of runoff is generally less than in the area without conservation practices. The peak rates of runoff are also appreciably lower. From data previously published, and adjusting for the differences in rainfall, the predicted rate at Station Y-2 should have been 0.905 inch per hour, whereas the measured runoff rate was 0.887 inch per hour. Considering the amount of adjustment required for rainfall differences, this should be considered an excellent fit.

"Samples from the W-10 and Y-10 watersheds to a depth of 60 inches on July 18 gave the following moisture percentages from corn, cotton, and oatstubble covers: corn, 27.9 percent; cotton 26.7 percent; oatstubble, 25.1 percent on the area W-10; and corn, 27.5 percent; cotton 30.0 percent, oatstubble, 30.9 percent on the area Y-10. The Y-10 area with the highest percentage of moisture has conservation measures applied, whereas the W-10 area has the conventional straight-row farming. Both areas have ample moisture at this time for good crop yields. Soil samples from adjoining plots of meadow grass, with and without nitrate fertilizer, showed 3.4 percent more moisture under the area which produced only 0.75 ton of hay per acre in comparison with the area which produced 2.10 tons of hay per acre. The increased fertility apparently enabled the plants to utilize more moisture in crop production.

"Areas removed from cultivation and seeded to native meadow grasses on the station have not produced profitable yields of hay in comparison to the old native meadows. An attempt to step-up the production on these new meadows by the use of fertilizers is under way. A uniform application of 300 pounds of 20 percent superphosphate applied in the fall with a spring application of 32, 64, and 96 pounds of nitrogen per acre gave the following yields per acre of air dry hay: 32 pounds nitrogen, 1.19 tons; 64 pounds nitrogen, 1.86 tons; and 96 pounds nitrogen, 2.20 tons of air dry hay per acre in comparison to only 0.62 ton on the check areas without the application of nitrogen."



Table 1.--Total runoff and peak rates - storm July 4, 1949

Area	Treatment	Rainfall	Total runoff	Rainfall - runoff	Peak runoff rate
		Inches	Inches	Inches	Inches/hour
C	Private Land.	0.335	0	0.3350	0
D	Some conserva- tion practices	.386	.0001	.3859	.0001
W-1	Ordinary Farm Practices	2.864	1.0695	1.7945	1.38
W-2	Ordinary Farm Practices	2.620	.6808	1.9392	1.22
W-6	Ordinary Farm Practices	2.600	.8413	1.7587	1.55
W-10	Ordinary Farm Practices	2.650	1.0028	1.6472	2.53
Y	Conservation Practices	2.884	.9025	1.9815	1.00
Y-2	Conservation Practices	3.002	.7823	2.2197	.887
Y-4	Conservation Practices	3.035	.8785	2.1565	.894
Y-6	Conservation Practices	3.068	.8937	2.1743	.963
Y-7	Conservation Practices	2.852	.8966	1.9554	1.37
Y-8	Conservation Practices	3.070	.5548	2.5152	.825
Y-10	Conservation Practices	3.024	.9582	2.0658	.935
SW-12	Native Meadow	2.910	0	2.9100	0
SW-17	Reestablished Pasture	2.870	.6709	2.1991	1.15

Hydrologic Studies - G. A. Grabb, Jr., East Lansing, Michigan.--"Precipitation for the month of July, as measured by the U. S. W. B. type of non-recording rain gage, amounted to 2.83 inches at the cultivated watershed, 3.77 inches at the wooded watershed, and 2.76 inches at the stubble-mulch plots. These amounts are approximately 91 percent, 122 percent, and 89 percent of the 50-year average July precipitation of 3.10 inches. Precipitation for the month of July, at the cultivated watershed, can be expected to equal or exceed 2.83 inches once in 2.2 years, according to the frequency curves prepared from the 1864-1948 precipitation records at East Lansing. Cumulative rainfall for the year is 113 percent of normal.

"There was one small runoff during the period from watershed B on July 9.

"The automatic recorder for a continuous record of soil moisture functioned throughout the month. Because of the fact that the plaster of Paris blocks were a little slow in reaching moisture equilibrium with the surrounding soil, the opportunity was taken several times of obtaining a record from identically located nylon blocks for a comparison. However, comparison between the two types

of blocks appears to be impossible because of the abnormally high resistance readings of the nylon blocks. Exhaustive tests proved that this high resistance was due to very high capacitance effect occasioned by the long leads of the nylon blocks. Immediate conferences were held with Dr. Bouyoucos in an effort to correct this trouble. Steps are being taken to electronically correct this effect, when using the Model C bridge, but it is deemed impractical to make such a correction in the recorder. Therefore, it is definitely recommended that nylon blocks be used with leads no longer than from 10 to a maximum of 20 feet with the Model C bridge, and no longer than 10 feet with the Leeds & Northrup recorder. This, in effect, is saying: Use only plaster of Paris blocks with a recorder. Nylon may be used with 20-foot, or longer leads, with a suitably compensated bridge. The recorder is functioning properly with plaster of Paris blocks."

Hydrologic Studies - E. H. Kidder, Auburn, Ala.-"The monthly rainfall of 6.36 inches was 16 percent in excess of the July average of 5.48 inches. The July precipitation is the highest of the midsummer months, during an average year. It is exceeded only by February and March.

"The precipitation that fell during this month came from shower and thundershower activity. No rainfall was recorded during the first 9 days. This dry period was followed by a 9-day wet period, during which 5.39 inches of rainfall were measured. None of the storms exceeded a 2-year Yarnell frequency and no runoff occurred.

"Using the criteria that a drought period is a period of not less than 2 weeks in duration during which time no 24-hour rainfall exceeds 0.25 inch, it was determined that a 19-day drought period existed from June 22 through July 9. Corn on the upper part of the 15- and 20-percent-slope plots was wilted on July 6. This would indicate that the soil moisture available to the crop had fallen below the wilting point level."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Edwardsville for the month was 3.49 inches. All of this occurred as scattered light showers excepting on the 19th, when the precipitation was 1.67 inches. The runoff from this storm was 0.177 inch on the 28-acre cultivated area, and 0.122 inch on the 50-acre pasture watershed. Temperatures were near normal for the month, with a maximum of 97° on the 1st of July and a minimum of 56° on the 31st."

Muck Drainage Experiment, Walkerton, Ind. - R. B. Hickok, LaFayette, Ind.-"A significant effect of water-table levels on soil moisture changed due to rainfall are indicated by the following tabulation of changes in mean levels between the afternoons of July 28 and 29, with 0.82 inch of rain in the morning of the 29th.

Table 1.--Response of Ground-water levels to 0.82 inch rainfall, on muck drainage plots, Walkerton, Ind., 7-29-49

Prescribed control depth, Inches	Decrease in depth due to rainfall (Inches)
	(Mean for 2 plots)
45	1.92 and 0.84
30	1.80 and 1.80
24	2.52 and 0.60
15	5.64 and 6.12



"It may be seen that the water level tends to fluctuate much more with rainfall with the higher control level. Furthermore, such fluctuation is most serious with respect to possible crop damage with the higher initial levels."

Drainage Studies - I. L. Saveson, Baton Rouge, Louisiana.-"We have been working in cooperation with the Buckeye Trencher people adapting a wheel-type trencher to cut lateral ditches for sugarcane land. The machine shipped in was a stock wheel-type machine with the addition of a couple of sloping side cutters to slope banks of the ditches, and a high speed paddle wheel on the end of the conveyor to scatter the earth. This machine worked beautifully under dry conditions and with a minimum of trash in the ditch. Under wet and trashy conditions we encountered considerable difficulty and we have the machine in the shop now making a number of changes and additions to meet our Louisiana conditions. We widened it in order to straddle the ditches and installed some rolling coulters and mold boards to move the earth from the slope into the wheel."

"The chief engineer from the Buckeye ditcher people was here on August 8 and they are making up several parts to change the machine to meet our conditions. These changes are a four point suspension of the wheel instead of three in order to get more clearance for trash and earth to move into the wheel. Also they are designing a set of power driven side cutters to slope the ditch."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"During July, 5.44 inches of rain fell at the Everglades Experiment Station, and evaporation from the standard pan was 5.83 inches. The mean maximum temperature was 91.0° and the mean minimum temperature was 69.8°."

"In 1940 cross sections were made every 200 feet along a 2,400-foot reach of the Cross Canal approximately 7 miles east of Belle Glade, Fla., when a 'slope course' was established for determining values of 'n.' Since that date this Canal has not been redredged for maintenance, and for the period 1940 to 1947 a heavy growth of water hyacinths completely covered the water surface. In 1947 the hyacinth eradication program of the Everglades Drainage District was begun and the hyacinths eliminated during 1947 and 1948 by spraying with 2-4-D. The flow velocity in this channel is very slow and not sufficient to flush out any vegetative or mineral precipitation that characteristically accumulates as sludge deposits in the Everglades Canals."

"A re-survey was made of the reach during latter part of July over the same sections originally surveyed in August 1940 to determine the change in cross-sectional shape during the intervening 9 years. The original and recent sections have been superimposed upon each other and plotted on a scale of 5 feet to the inch. They are now being planimetered to determine the decrease in area due to the bottom deposits of sludge as well as the slight increase in the top width due to sloughing of the banks. Visual examination of the plotted sections indicate an average deposit of from 2 to 3 feet of sludge since 1940, while the top width has increase about 2 feet over the same period. There appears to have been a total decrease in cross-sectional area at bank full stage of approximately 20 percent. A complete tabulation of these items will be available for inclusion in next month's report."



"An inspection was made of the water-conservation area being developed by the West Palm Beach Water Co. This area lies to the west of the City of West Palm Beach and consists of a north-south dike along the eastern edge of the Loxahatchee Slough beginning at the Seaboard Railroad. Stub dikes extend to the west at the upper and lower ends of the area. The total area within the dikes being about 10,000 acres. The west side of the rectangular area is open to receive runoff into the reservoir from the slightly higher lands to the west. A canal with controls leads water from this area into the Lake Mangonia basin within the City of West Palm Beach from whence it is pumped into the water-treatment plant. On July 7, a flow measurement was made on the conveying canal at Military Trail, at the request of the Resident Engineer, which showed a flow of 36.63 second feet toward Lake Mangonia."

Drainage Studies - M. H. Gallatin, Homestead, Florida. - "Rains of varying intensity, amount, and duration were recorded in the various gages over the area 26 days during the period. During this period one rain of over 3 inches was recorded, two rains of over 2 inches, and 16 rains of an inch were recorded at our gages in the area. The following table gives the totals by months for our gages for the past 4 years.

Location of Gage	July 1949	July 1948	July 1947	July 1946
Redland and Mowry	7.17	6.07	11.63	10.03
Sub-Tropical Expt. Sta.	7.83	9.05	13.62	9.96
Redland and Gossman	10.17	7.76	14.95	7.45
Plummer and Comfort	11.71	-----	-----	-----
Petters, Fla.	8.28	9.99	16.34	10.45
Princeton Grove	8.81	5.92	11.67	9.12
Cooper Grove	11.21	8.93	12.38	8.95
W. Mowry	6.29	5.86	4.77	-----
E-33	4.65	6.05	4.70	-----
Roberts and Avocado	7.79	7.07	14.20	-----
Jeran Grove	6.82	-----	-----	-----
Country Club and Waldin	9.70	-----	-----	-----

Rains of 3 inches or more: -1- 8/17/49  
 " 2 inches " " -2- 8/6/49, 8/11/49  
 " 1 inch " " -16- 8/1, 4, 5, 6, 7, 8, 9, 17, 18, 19, 20, 23, 25, 26, 30, 31.

"As a result of rainfall which fell at some point in the area 25 out of the 31 days, we had a slow constant rise in our water table except during the period July 13-16 when slight losses were recorded.

"For the Redland Profile for the period gains were recorded ranging from 0.14 to 0.70 foot. For the Mowry Street Profile gains of 0.21 to 0.68 foot were recorded. For the Eureka Profile gains of 0.34 to 1.67 feet were recorded.

"So far as retention and conservation of moisture is concerned our work to date has shown that mulching is beneficial. Some types of materials are more satisfactory than others. While the shavings conserve moisture we have found that nitrification of this material is very slow while grass and pine straw not only serve as a moisture conservation material but also are a slow source of nitrogen. Also it has been found that our losses of nitrate nitrogen are not as high in areas kept mulched.

"Since the initiation of our nitrate leaching study, there has been a definite trend by fertilizer mixing plants in the area to utilize nitrogen materials from organic sources in making up the nitrogen portion of the fertilizers. In the past the usual analysis contained 20 - 40 percent organics of which a part, though classified as organics, would break down rapidly, and leach out rapidly. Our work has shown that the more inert types will give lower constant levels of nitrogen that will not leach as readily. As a result of this work, the fertilizer plants in the area are utilizing our data in making up their fertilizers.

"On a 30-acre avocado grove where applications in the past were made every 90 days, applications have been cut down by following our data to 2-1/2 applications per year.

"In another 40-acre grove instead of four applications per year, by use of higher organics we have been able to maintain a relatively high level with only two applications a year.

"By following data available to these growers, they have saved about \$600 - \$1,000 per application for a 30-40-acre grove. Last winter through use of our data two large grove owners estimated they had saved approximately \$5,000. By using organic sources of nitrogen we have been able to maintain a more uniform level of nitrate nitrogen for the plants to utilize during the season when growth is being made.

"On the basis of data obtained at our Highlands water-control plot and utilizing the marl seal-type of ditch, a 120-acre installation is being put in south of Florida City. This is part of a 12,000-acre development.

"Another area adjacent and east of our Highlands plots is under construction using the marl seal-type of ditch and following our plan of development. This area will cover about 80 acres.

"In the past all drainage and water-control work in the area consisted of digging ditches into the rock. From the time we started mapping in the area, I had the theory we could do a better job by using shallow ditches where a layer of marl was allowed to remain over the rock. In cooperation with the Sub-Tropical Experiment Station we set up the Highlands water-control plot in the fall of 1946. We have found that we could, with low pumpage, control the waters in the diked area. Whereas when deeprock ditches were used the pumpage is extremely high. We have no comparative data at present except size of pumps used. On the rock ditches it requires pumps of 4-5 times the capacity used on our marl seal-type to control the water."

Supplemental Irrigation Studies - J. R. Carreker, Athens, Georgia.-

"High temperatures prevailed during most of the month. The first 12 days was quite dry, with only 0.22 inch of rain on the 3d and 0.04 inch on the 10th. A 10-day rainy spell began July 12. A total of 3.45 inches fell between the 12th and 21st, with a maximum for any day of 1.01 inches on the 18th. No rain fell after the 21st and irrigation was needed by the end of the month.

"The total rainfall in July was 3.71 inches, which was 1.33 inches less than normal. The surface evaporation was 6.48 inches.



"Irrigations were made during July as follows:

July 1       Vegetables-sprinkler irrigation = 1.0 inches  
 July 1       Corn-furrow irrigation = 0.75 inch  
 July 2       Corn-sprinkler irrigation Block I = 1.51 inches  
 July 5       Cotton\*-sprinkler irrigation = 1.43 inches  
 July 5&6     Alfalfa\*-sprinkler irrigation = 1.00, 1.43 & 2.50 inches  
 July 6&7     Pasture-sprinkler irrigation = 1.93 inches  
 July 8       Vegetables-sprinkler irrigation = 1.50 inches  
 July 8       Corn-furrow irrigation = 1.91 inches  
 July 11&12   Corn-sprinkler irrigation Block I = 1.53 inches  
 July 29      Corn-sprinkler irrigation, Block II = 1.50 inches  
 \* On the Southern Piedmont Conservation Experiment Station at Watkinsville, Ga.

"Soil moisture samples were taken in the alfalfa on July 6, 21 hours after the first irrigation run was made. The percent moisture, oven dry basis, for the different irrigation levels are given in table 1.

Table 1.--Soil moisture 21 hours after irrigation of alfalfa on July 5, 1949, that was recently cut for hay.

Depth of soil sample inches	0	Irrigation 1.0"	application 1.4"	2.5"
		Soil moisture - percent		
3		11.5	13.7	13.3
6	6.1	10.4	16.4	16.6
9		9.0	17.2	18.6
12	9.9	9.4	18.0	19.2
18	14.0	11.7	17.5	22.1
24	16.1		16.5	23.9
30				22.2

Antecedent precipitation:   June 24-25 = 0.40"  
                                   July 3       = 0.20"

"Rothane (DDD) was applied to the corn in Block II plots through the irrigation water on July 29, for controlling the corn ear worm. Two pounds of wettable dust were dissolved in 10 gallons of water. This solution was applied through the suction side of the pump in 3 minutes with an output of 166 gallons per minute of water. The corn was in the early silk stage. The effects of this trial will be apparent in about 3 weeks when the grains fill out well.

"Further nitrogation studies were made June 30 with the anhydrous ammonia and Barrett's solution 32 on the corn in Block IV. The solution 32 was applied at the rate of 1.6 lb/min. of N through a flow of water of 68.9 gallons per minute. No detrimental effect was noticed on the corn.



"A calibration was made on the valve controlling the output of anhydrous ammonia from the cylinder. Each test was with a rate of flow of 26.0 gallons per minute of water. Valve opening settings were made at 60, 120, and 180°. Runs were made with the valve open 20 minutes at each of these settings. A second set of tests were then made with the valve open 10 minutes at each setting. The output of ammonia in pounds per minute for these 2 runs was:

Valve opening degrees	1st run: 20 min. NH <sub>3</sub> , lb/min.	2d run: 10 min. NH <sub>3</sub> , lb/min.
60	0.163	0.413
120	.262	.875
180	1.275	1.250

"There was a good relationship between the degree of valve opening and the output of ammonia in the second run, but not so in the first one. These results suggest that further testing of this equipment is needed.

"Indications of burning were apparent on the corn leaves within an hour after the ammonia was applied. Burning was more severe from the first run and with the higher rates of application. The corn was definitely set back by this injury, but had made good recovery by the end of July."

## IRRIGATION DIVISION

Irrigation in Mexico - Harry F. Blaney, Los Angeles, California.-"During my vacation, the technical sessions of the Irrigation Division of the American Society of Civil Engineers Convention at Mexico City were attended. Also many of the irrigated areas of Mexico were inspected. The principal theme of the convention was Water Resources of Mexico.

"Papers presented at the meeting indicate that some 60,000,000 acres of land are suitable for cultivation in Mexico, of which around 20,000,000 acres can be irrigated from surface and underground waters; 5,000,000 acres can be put under cultivation by rainfall once they are drained, and 35,000,000 acres will be arable in part, subject to eventual rains and very uncertain conditions. At present about 5,000,000 acres are being irrigated and 15,000,000 acres are dry farmed under very fortuitous conditions. It is estimated that Mexico will never be able to cultivate, with assurance of water, more than 1 acre per inhabitant. This is considerably less land than the United States is now cultivating. The irrigation program contemplates the investment of 1,500 million pesos during the 6-year period (1946-52), which when completed will furnish water to more than 2,000,000 acres of land. The Obregon Dam on the Yaqui River, now being constructed on the West Coast of Mexico, will supply water to 550,000 acres of land.

"In non-irrigated areas, crops are being grown on land with slopes ranging from zero to 50 percent. Excessive erosion occurs on most of the steeper slopes and the rivers carry large quantities of sediment."

Drainage of Irrigated Land - W. W. Donnan, Los Angeles, Calif.-"Some progress has been made in both the theoretical and practical aspects of the leaching of harmful accumulations of saline and alkaline salts. Where drainage problems have required the installation of deep tile drains, the land is often too impregnated with salts to produce good crops. These salts must be leached downward and out through the tile system. The usual practice is to pond water on the ground surface for extended periods of time. In Imperial Valley, California, water is often ponded for 90 days. Two things occur which make this practice theoretically unsound. It has been found by field observation that in about 75 percent of the fields leached in this manner, the collecting lines are overloaded. Back pressure of as much as four feet occurs in the lines. Thus the only area actually being leached is the upper one-third of the field; the balance of the field not only is not being leached, but it is theoretically being impregnated with highly concentrated saline water."

Imperial Valley Investigation - George B. Bradshaw, Imperial, Calif.-"During the past year, considerable improvement has been made in the construction of concrete drainage tile in the Imperial Valley. The breaking strength and density of the tile have been increased along with a reduction in absorption. This increase in breaking strength and the decrease in absorption is credited to better methods of curing the tile and to obtaining a proper dense mix of concrete. A strong dense low absorption tile is practically a necessity in the Imperial Valley, as the soil is relatively high in sulfates. The mean breaking strength and absorption for the two periods are:"

	Breaking strength lbs. per lin. ft. 3-point bearing	Absorption
October 1947 to June 1948	2,382	8.44
July 1948 to June 1949	2,963	5.58"



Santa Ana River Water Conservation Studies - Dean C. Muckel, Pomona, California.-"The average annual deep penetration of rain and irrigation water on agricultural lands in the Yucaipa-Beaumont area for the period 1927-28 to 1947-48, inclusive, is as follows:

Average annual deep penetration, in inches				
Classification	Rain	Irrigation	Classification	Rain
<u>Irrigated crops</u>			<u>Unirrigated crops</u>	
Annual	5.2	4.0	Fallow	7.0
Citrus	3.0	1.6	Grapes	2.2
Deciduous	3.3	1.3	Deciduous trees	2.3
Permanent pasture	1.8	0	Hay and grain	2.6
Hay and grain	2.6	.5	Pasture	2.6
Alfalfa	2.3	0		

"This water is assumed to be a direct contribution to the ground-water supplies. Rainfall occurs only during the winter months and averages 19 inches annually. The average irrigation application is about 20 inches."

Water Spreading for Storage Underground - A. T. Mitchelson, Dean C. Muckel, Hayden K. Rouse, E. S. Bliss, Curtis E. Johnson, California.-"During the latter part of the month, a representative of the Atlas Powder Company of Wilmington, Delaware, visited the Berkeley office to explain the qualities of a chemical developed by the Atlas Company which has been successfully tried by the University of Arizona in accelerating infiltration through irrigated soils. As suggested, the company had two men visit the Bakersfield laboratory where they discussed the local problem with our technicians and they left a supply of the chemical for experimentation by our men.

"The value of this research project in the San Joaquin Valley is becoming more and more evident as the conditions of ground water in that area are brought to the attention of agricultural, municipal and industrial users. Probably from half to three-fourths of water used for all purposes in that area of the Valley south of Kings River is pumped from deep underground aquifers. Recent measurements made of depths to water in wells have resulted in decision in many cases to lower the bowl of the pumps in order to continue draft of water from the basin affected. In one area immediately adjacent to one of the groups of experimental spreading ponds, one large farming enterprise has found that measurements made in some 75 to 100 of its wells showed that in nearly every case the pumping level was at or below the bowl setting. This means that the wells will begin breaking suctions at another 14 to 20 foot drop in water level."

R-3-2-1 #1 Friction Losses in Pipes and Fittings - Carl Rohwer, Ft. Collins, Colo.-The report on Friction Losses in Valves and Fittings for Irrigation Pumping Plants was completed and copies were sent to the Director of the Colorado Agricultural Experiment Station and to the Chief of the Division of Irrigation, Soil Conservation Service. This report contains the results of friction loss studies on foot valves, check valves, gate valves, strainers and bell entrances, made at the Bellvue laboratory. Although the losses were generally small, the total of the losses from all the fittings used in a pumping plant is appreciable and should not be neglected when designing a plant.



R-3-2-1 #2 Performance Tests on Well Screens - Carl Rohwer, Ft. Collins, Colo.-Copies of Gilbert Corey's thesis on the Hydraulic Properties of Well Screens were prepared for the sponsors of the project and the cooperating manufacturers. This is a report on the losses through various screens for the condition without gravel envelope and with gravel envelopes of 1, 1/2, and 1/4 inch gravel for a wide range of discharges. These tests show that the losses are independent of the type of screen so long as the percentage of openings is 20 percent or more of the gross screen area. This conclusion is based on tests on 7 screens. More complete tests, however, covering a wider range of screens may make it necessary to revise this conclusion.

Irrigation Studies - E. Stutes, Weslaco, Texas.-"Irrigation efficiencies ranged from 57 percent to 91 percent. All the high efficiencies were obtained in plots that had been divided into two parts with an auxiliary border which placed four rows in one and three in the other part. The near level borders seem to require a large head of water to irrigate successfully. A 4-inch irrigation should be applied within 20 minutes to prevent excessive percolation near the ditch and get a uniform irrigation on the sandy loam soil on which the plots are located. Soil cores were taken for apparent specific gravity determinations. The results indicate greater apparent specific gravity on July 19 than on May 12, when the first cores were taken. Samples that indicated 1.41 average in May showed 1.51 in late July. Physical dimensions and weight were used in both cases and in the July checks were run by the paraffin method. The results were unusually close together.

Sprinkler Irrigation Studies - Wayne Criddle, Boise, Idaho.-Studies were continued on the application of irrigation water by sprinkler methods on the Black Canyon experimental area in southwestern Idaho and additional information was gathered on the use of sprinklers on various farm setups. During the month an electric motor and pump were installed to operate the experimental sprinkler setup. Soil samples of moisture content before and after irrigation were taken. An attempt is being made to determine the efficiency of the sprinkler irrigation.

8/24/49

